type, and a first buried layer under the first deep well, the first buried layer having the first conductivity type.

[0012] The second LDMOS device may include a second gate on the substrate, a second body region at one side of the second gate, the second body region having the second conductivity type, a second body contact region in the second body region, the second body contact region having the second conductivity type, a second drain region at another side of the second gate, the second drain region having the first conductivity type, a second isolation region in the substrate between the second body region and the second drain region, the second isolation region overlapping a portion of the second gate, a second deep well under the second body region, the second deep well having the second conductivity type, and a second buried layer under the second deep well, the second buried layer having the first conductivity type.

[0013] A length of the second isolation region may be equal to or smaller than a length of the first isolation region. A second overlapping length between the second isolation region and the second deep well is equal to or greater than a first overlapping length between the first isolation region and the first deep well.

[0014] The NPN bipolar transistor may include an emitter region having the first conductivity type and a base region having the second conductivity type. The emitter region having the first conductivity type may be spaced apart from the second body region. The base region may be being under the emitter region of the first conductivity type and may surround the emitter region of the first conductivity type and the second drain region. The PNP bipolar transistor may include an emitter region having the second conductivity type and an epitaxial layer having the first conductivity type. The emitter region having the second conductivity type may be between the second drain region and the second isolation region, and the epitaxial layer may be on the second buried layer and the second body contact region.

[0015] The electrostatic discharge protection device may include an impurity region having the first conductivity type, the impurity region being between the second isolation region and the emitter region having the second conductivity type. The semiconductor device may include a poly resistor connected to the second body contact region.

[0016] The NPN bipolar transistor may include the second drain region, a base region that has the second conductivity type and that is at one side of the second body region, and an emitter region having the first conductivity type. The emitter region having the first conductivity type may be on the base region and the second body region while extending over the base region and the second body region. The PNP bipolar transistor may include an emitter region having the second conductivity type and an epitaxial layer having the first conductivity type. The emitter region having the second conductivity type may be between the second drain region and the second isolation region, and the epitaxial layer having the first conductivity type may be on the second buried layer and the second body contact region. The semiconductor device may include a third isolation region between the second drain region and the emitter region having the second conductivity type.

[0017] Embodiments may also be realized by providing a semiconductor device including a substrate having a first region and a second region defined therein, the first region having a first LDMOS device of an output port formed therein, the second region having an electrostatic discharge protection device formed therein, and the electrostatic discharge protection device including a second LDMOS device and a bipolar transistor. The embodiment also includes a method of forming the semiconductor device that includes forming a first buried layer in the first region and a second buried layer in the second region by implanting impurity of a first conductivity type into the substrate, forming a first deep well in the first region and a second deep well in the second region by implanting impurity of a second conductivity type into the substrate, forming a first isolation region in the first region and a second isolation region in the second region, forming a first gate on the substrate in the first region and a second gate on the substrate in the second region, forming a first body region in the first region and a second body region in the second region by implanting impurity of the second conductivity type into the substrate, and implanting impurities of the first and the second conductivity types into the substrate to form a first body contact region of the second conductivity type in the first body region and a second body contact region of the second conductivity type in the second body region, first source and drain regions of the first conductivity type in the first region, an emitter region of the first conductivity type in the second region, and a second drain region of the first conductivity type in the second region.

[0018] The second isolation region may be formed to have a length that is equal to or smaller than a length of the first isolation region. The second isolation region may be formed to have a second overlapping length between the second isolation region and the second deep well that is equal to or greater than a first overlapping length between the first isolation region and the first deep well.

[0019] After the forming of the first and second isolation regions and before the forming of the first and second gates, the method may include forming a base region in the second region by implanting impurity of the second conductivity type into the substrate. A portion of the base region may be formed to overlap with the second deep well such that other portions of the base region are in a non-overlapping relationship with the second deep well. A doping concentration of the base region may be higher than a doping concentration of the second deep well and lower than a doping concentration of the second body region.

[0020] A first distance from a bottom surface of the substrate to a bottom surface of the base region may be greater than a second distance from the bottom surface of the substrate to a bottom surface of the second body region. After the forming of the first and second deep wells and before the forming of the first and second isolation regions, the method may include forming a first drift region in the first region and a second drift region in the second region by a second process of implanting impurity of the first conductivity type into the substrate.

[0021] After the forming of the first and second buried layers and before the forming of the first and second deep wells, the method may include forming an epitaxial layer having the first conductivity type on the first and second buried layers. The method may include forming an emitter region having the second conductivity type in the second region during the forming of the second body contact region having the second conductivity type in the second body region by implanting impurity of the second conductivity type into the substrate. The method may include forming a